

LIST OF THE ANOPHELINES OF THE MALAY ARCHIPELAGO WITH
SPECIAL REFERENCE TO ADULTS AND LARVAE OF NEW OR
INCOMPLETELY DESCRIBED SPECIES OR VARIETIES.

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The following species and varieties have been found in the Malay Archipelago* :—

Myzomyia : ludlowi, rossii, vaga (indefinita), flava, minima, minima var. aconita.

Neomyzomyia : leucosphyra, punctulata var. tessellata.

Cellia : kochi.

Myzorhynchus : sinensis, sinensis var. vanus and var. separatus, barbirostris, barbirostris var. pallidus, albotaeniatus, mauritianus, umbrosus, gigas.

Nyssorhynchus : fuliginosus, maculatus, schüffneri, karwari, jamesi, annulipes var. moluccensis.

Stethomyia : aitkenii, aitkenii var. insulae-florum and var. papuae.

Comparison with the neighbouring Malay Peninsula shows the Anopheline fauna to be almost identical in the two countries. The exceptions are :—*M. aurirostris*, *P. watsoni*, *M. sinensis* var. *peditaeniatus*, *M. albotaeniatus* var. *montanus*, *M. pseudumbrosus*, *M. hunteri* and *L. asiatica*, which are not found in the Archipelago; whereas the Peninsula lacks *M. mauritianus*, *M. gigas*, *M. barbirostris* var. *pallidus*, *S. aitkenii* var. *insulae-florum* and var. *papuae*, and *N. annulipes* var. *moluccensis*.

I.—DESCRIPTION OF NEW SPECIES AND VARIETIES.

1. ***Myzomyia immaculata***, Theo.

Myzomyia flava, Swellengrebel (1917).†

A yellow mosquito, with light orange-coloured unbanded legs, creamy unbanded palpi, brownish yellow proboscis and creamy wing scales. Wings unspotted.

♀. Head scaled like *M. rossii*, on the occiput broadly expanding upright forked scales, all scales creamy. Palpi unbanded, creamy. Proboscis brownish yellow, labella yellow. *Thorax* : prothoracic lobes with brownish yellow hairs. Mesonotum with hair-like scales, narrow curved ones in front and a few at the sides, all scales creamy. Scutellum with dark yellow hairs and creamy hair-like scales. Halteres

* Contrary to the present custom we adhere (with a few exceptions) to Theobald's nomenclature, not because we attach to his "genera" any intrinsic value as indicating a really existing relationship, but because the division of the Anophelines into genera is a practical measure, expressing the idea present in the mind of every one who studies these insects in nature, that, e.g., *M. sinensis* is quite distinct from *M. aconita*, but closely allied to *M. barbirostris*, and that *S. aitkenii* is something apart from all other Anophelines. By calling all these species "*Anopheles*" one simply causes confusion and not simplification.

† [On a recent visit to England Dr. Swellengrebel presented to the British Museum a ♂ and ♀ of his *Myzomyia flava*. On comparing the latter with the type of Theobald's *A. immaculatus* both he and Mr. F. W. Edwards concluded that they were conspecific. The older name *immaculatus* must therefore be used for this interesting and little known form.—ED.]

creamy, light brown at the curve. *Abdomen* with golden hairs, narrow curved golden scales on genital lobes. *Legs* unbanded, light orange. *Ungues* equal and simple. *Wings* unspotted; scales narrow, creamy or light yellow. Base of 1st submarginal cell nearer the wing base than that of 2nd posterior; the cell is longer than its stem, 2nd posterior cell shorter than its stem. Supernumerary and anterior cross-veins meeting, the posterior one more than twice its length from the latter; 3rd longitudinal vein not ending at the meeting of the supernumerary and anterior cross-veins. *Length*, 4-5 mm.

♂. Like ♀. Club-shaped end of palpi yellow, owing to the presence of long yellow hairs mixed with the creamy scales; a dark narrow band caused by partial desquamation. Narrow-curved creamy scales on the two apical abdominal segments. On the wing, anterior cross-vein situated basally from the supernumerary. *Larva* unknown.

JAVA: Soerabaia. SUMATRA: Mandailing.

Rare. Described from 3 ♀♀ and 3 ♂♂ taken at Soerabaia, June 1917. Easily distinguished from other unspotted Anophelines by the long palps (*M. brevipalpis*) and the broadly expanding upright forked scales on the head (*S. aitkeni*). The species may perhaps be an albinoid variety of *M. vaga (indefinita)*, as this species sometimes shows a marked decrease of the black portions on the wings and palpi.

2. *Nyssorhynchus annulipes* var. *moluccensis*, Swell. (1920).

A rather large brown mosquito, with spotted legs, 4-5 light bands on palpi, the apex of the 2nd joint being black; proboscis dark, except labella; narrow curved scales on the whole dorsal surface of the mesonotum; wings much spotted, resembling those of *N. punctulata* var. *tesselata*.

♀. *Head* scaled as in other *Nyssorhynchi*. *Antennae* light brown, basal segment with small white scales, verticils and tomentum golden. *Proboscis* dark brown,

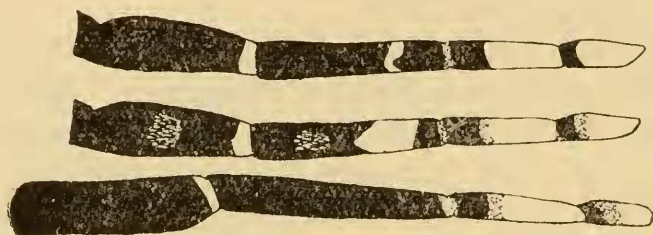


Fig. 1. Palpi of *Nyssorhynchus annulipes* var. *moluccensis* ♀, three variations.

labella lighter. *Palpi* (fig. 1): 1st joint black with creamy apex and sometimes a dorsal yellow spot in the middle; 2nd joint black, with a broad white band on apical half and a narrow yellow one at the apex, sometimes a yellow dorsal spot in the middle of the black basal portion, the sub-apical white band sometimes narrow or even absent; penultimate and terminal joints with a narrow black basal band, then a narrow yellow band, the remaining portion creamy. *Thorax*: prothoracic lobes blackish brown, with black chaetae and a tuft of black scales in front. *Mesonotum* with a dark spot to the right and left at one-third from the anterior border and one in front of scutellum, covered all over with narrow curved white scales,

which also are present on scutellum. Pleurae dark, with a few narrow curved white scales. Metanotum light brown, with a dark median line. Halteres white, with the knob dark at the apex. *Abdomen* dark brown; on apex of 6th and 7th segments narrow curved golden scales, on 8th black ones likewise. *Legs* dark brown with white spots, many of them forming incomplete rings; 1st tarsal joint banded apically, 2nd–4th at both ends (except in hind legs, which have an apical band only); 5th banded at both ends in front legs, unbanded in the others, in front and mid-legs this joint is white on one side. A sub-apical elongated light spot on the tibiae of front legs. Coxae yellowish brown, with narrow white scales. *Wings* (fig. 2):

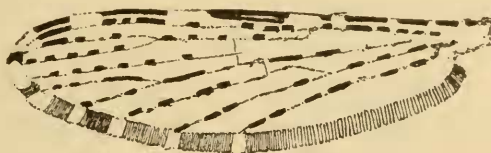


Fig. 2. Wing of *N. annulipes* var. *moluccensis*, ♀.

on the costa from base to apex 3 short and 4 long black spots and a short one between the 1st and 2nd long spots, these last three extending on to the sub-costa. The 1st–4th long costal spots extend on to the 1st longitudinal in the form of 2, 3–4, 3–4, small spots and one long one; moreover a small spot below the interval of the 1st and 2nd and the 2nd and 3rd costal long spots, and 1–3 at the base. Other small spots are present as follows:—3–5 on upper branch, 5–7 on lower branch, 2–4 on stem of 2nd vein; 5–6 on 3rd vein; 2 apically, one longer basally on upper branch, 2–3 on lower branch of 4th vein, on its stem below the cross-veins a long one, above them 2 long or 1 long and 2 short ones; 4 on the upper branch and lower one, 3 on the stem of the 5th vein; 5–6 on the 6th vein. Fringe dark with bright incisions at the tips of the veins and upward from the 3rd longitudinal vein, except a narrow black spot between the branches of the 2nd vein. Length of 1st submarginal cell more than twice that of stem, its base situated basally from that of 2nd posterior cell. Supernumerary and anterior cross-veins almost meeting, posterior one twice its length from anterior.

Length, 4–5.5 mm.

♂. *Palpi*: 1st joint black, mixed with white on one side; articulation with 2nd joint light, owing to absence of scales; 2nd joint with one side of basal half and top white, the latter white portion fringed with yellow. Club-shaped end white, black on one side, with basal and median black ring, separated from the white by a yellow margin. *Length* 5–6 mm.

MOLUCCAS. NEW GUINEA.

Described from 5 ♀♀ and 3 ♂♂.

Larva (fig. 3). *Length* 5 mm. Colour greenish brown or dark greyish-green; head brown, with dark bands and spots; white spots on thorax in front and on abdominal segments iii and vii or iii and vi–viii. Antennae without branched hair. Median clypeal hairs far apart, with a few short hairs; external clypeal hairs often nearly as long as medians, with long hairs; posterior clypeal hairs as far apart as medians, reaching to the base of the latter, unbranched or with 2–3 branches.

External occipital hairs with 4 branches, internal ones with 3 branches or simple. A pair of small fans* on thorax, with 10-14 leaflets, sometimes pigmented, no serrate margin. Small fans on abdominal segment i, with 8-16 leaflets, usually serrate, not pigmented. Complete fans on segments ii-vii, with about 18 leaflets, pigmented, serrate near the tip, the latter long and pointed, sometimes ending in a true filament. Shoulder hairs † with thick stem and numerous branches; median and internal one with stout roots which often unite into one.

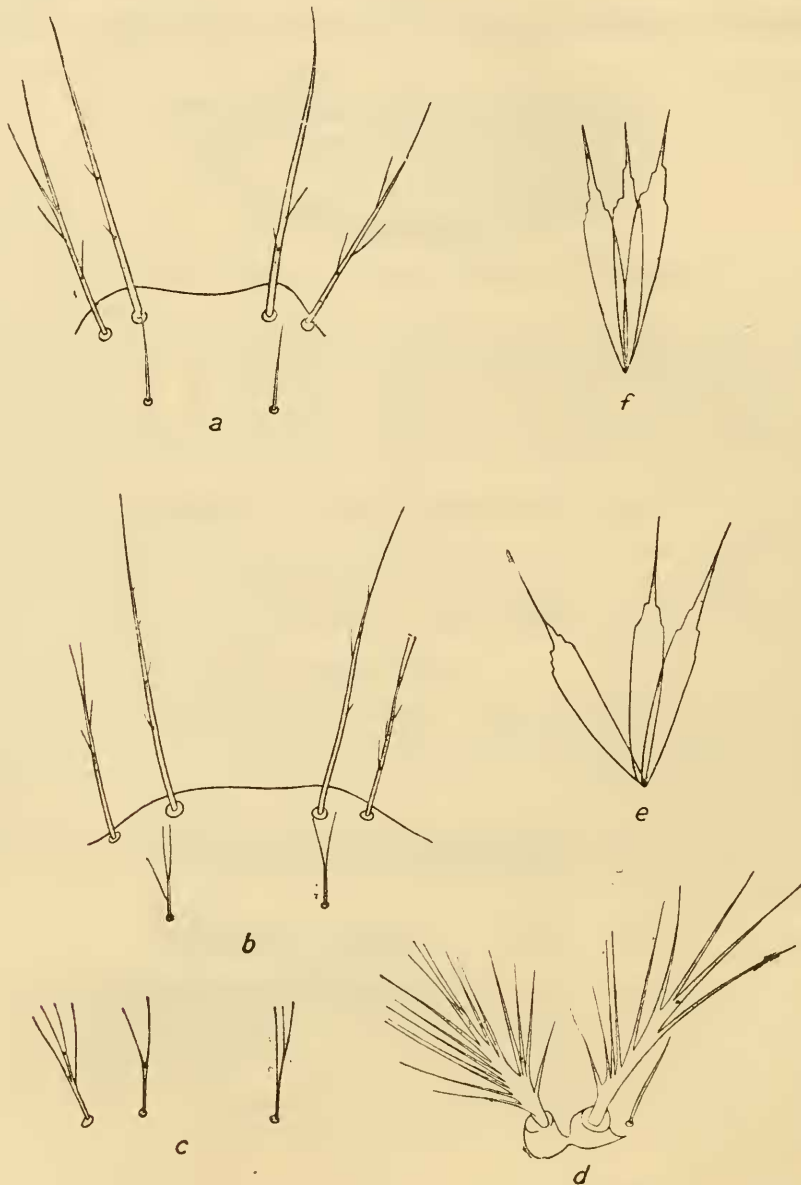


Fig. 3. Larva of *N. annulipes* var. *moluccensis*: *a*, *b*, two types of clypeal hairs; *c*, occipital hairs; *d*, shoulder hairs (right); *e*, *f*, leaflets.

Breeds in all kinds of water, brackish or salt and fresh, running and stagnant, clean and dirty; also in artificial collections of water (coconut-shells, water in native boats).

* Fan = stellate tuft.

† Shoulder hairs = anterior thoracic hairs.

This variety much resembles *N. annulipes*, Walker, as described by Theobald, but the female palpi are different in the latter, the apical half of the 2nd joint being all white. Also, there is a marked likeness to *N. punctulata*, Dön., but the proboscis of this species has a light apical half and the black apical ring of the 2nd palpal joint is much narrower.

3. ***Stethomyia aitkenii* var. *insulae-florum***, Swell. (1920).

The imago is not to be distinguished from *S. aitkenii*.

Larva (fig. 4). Length 5 mm. Colour dark green. Antenna with small branched hair. Median clypeal hairs close together, simple, nude; external clypeal hairs simple, nude, length $\frac{1}{3}$ of median ones; posterior clypeal hairs far apart, short, with 3-6 branches; occipital hairs with 3-6 branches. Shoulder hairs with only the median one inserted on a strong root, carrying about 11 branches, the internal one with about 8. Small fans on thorax and abdominal segment i, carrying 13-15

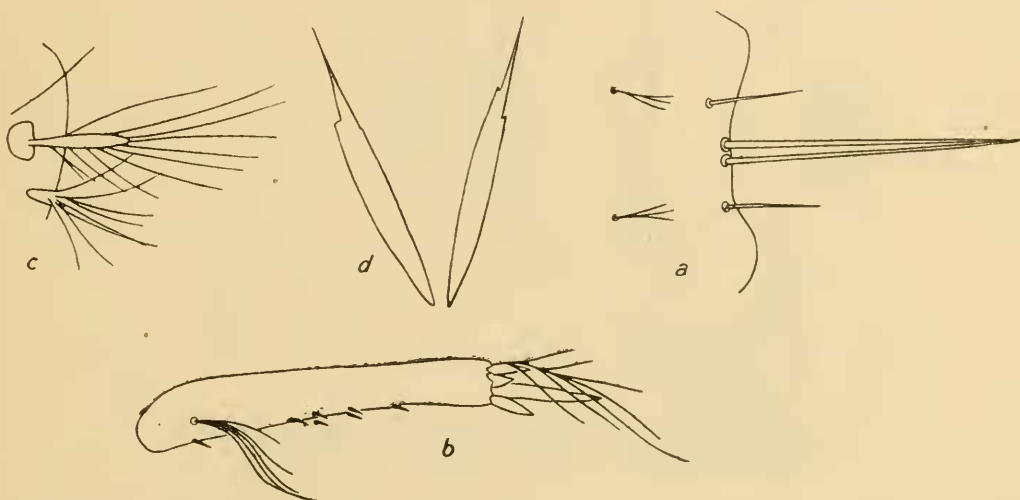


Fig. 4. Larva of *Stethomyia aitkenii* var. *insulae-florum*: a, clypeus; b, antenna; c, shoulder hairs (left); d, leaflets.

non-serrate leaflets; segments ii-vii with complete fans, the leaflets very indistinctly serrate, ending in a long point, no filaments.

Breeds in running water in the weeds along the edges, in hilly regions. With the variety *papuae* it is the only representative of this species in the Australian region of the Archipelago. Only once has it been found in Java (Island of Noesa Kembangan on the South Coast).

The larva is somewhat like that of *S. culiciformis*, James, but the club-shaped antennal hair is wanting and the balancing hairs on abdominal segments i-iii are of the usual type and number.

4. ***Stethomyia aitkenii* var. *papuae***, Swell. (1920).

Although no adults could be bred from this larval variety, we feel sure that it likewise belongs to this species. It much resembles the larvae of the preceding variety, but is separated from it by the fact of the internal shoulder hairs being very small and carrying two branches only. The leaflets of all the fans show no signs of serration.

The larvae described here, were full-grown, the pupal hairs already showing through the integument of the 1st abdominal segment.

Breeds in the same places as the foregoing variety, but was only found in New Guinea (Kokas, Kaimana, May 1919).

4. **Myzorhynchus barbirostris** var. **pallidus**, nov.

Adult like *M. barbirostris*.

The relation of this variety to its type is the same as that of *M. peditaeniatus*, Leic., to *M. sinensis*, viz., the larvae differ from the typical ones by the external clypeal hairs bearing a smaller number of branches (11–22 against 60 or more in the type) (fig. 5).

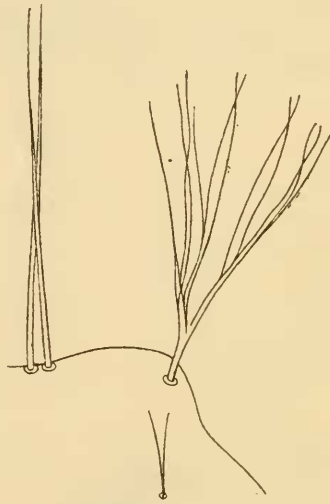


Fig. 5. Larva of *Myzorhynchus barbirostris* var. *pallidus*, right half of clypeus.

Breeds in slowly running water, in springs in the jungle and in rice-fields, but always in hilly country. It is rare in Java and Sumatra; in the Australian portion of the Archipelago it is as common as the typical form.

II. LARVAE OF KNOWN SPECIES NOT YET OR INCOMPLETELY DESCRIBED.

1. **Myzorhynchus albotaeniatus** (fig. 6).

Length 5–5.5 mm. Colour dark rusty brown, lighter on dorsum of 3rd abdominal segment, less conspicuously so on the 6th, the 4th almost black. Antennae more stumpy than in *M. sinensis*, length : breadth : : 1 : 4 (1 : 5 in *sinensis*); a branched hair on antennae, its stem half the length of the hair (in *sinensis* $\frac{1}{6}$ – $\frac{1}{7}$), the branches emitted nearly at right angles (in *sinensis* at very sharp angles). Median clypeal pairs simple, nude, the distance between them equal to that separating them from the external clypeal hairs (close together in *sinensis*); external clypeal hairs with 18–24 terminal branches; posterior clypeal hairs short, with 3 branches; occipital hairs with 6–7 branches. Internal shoulder hair very small, with 2–3 short apical branches. Small fans with 12–16 non-serrate leaflets on thorax and abdominal segments i–ii; complete fans on segments iii–vii; leaflets as in *M. sinensis*.

Breeds in slowly running jungle streams with scanty vegetation but much vegetable detritus. Java and Sumatra.

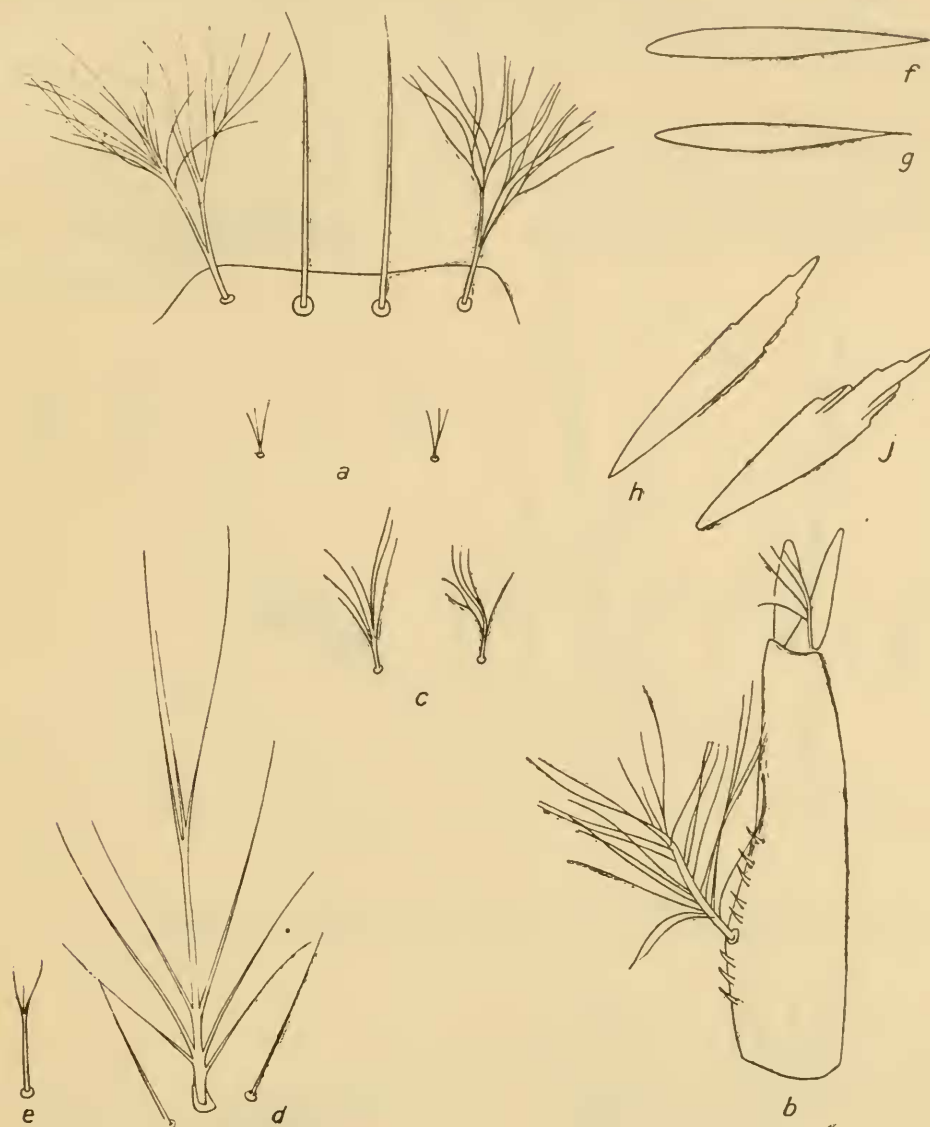


Fig. 6. Larva of *Myzorhynchus albotaeniatus*: a, clypeus; b, antenna; c, occipital hairs; d, shoulder hairs (right); e, variation of inner shoulder hair; f, leaflet, thoracic fan; g, leaflet, fan on abdominal segment i; h, leaflet, segment iv; j, leaflet, segment v.

2. *Neomyzomyia leucosphyra* (fig. 7).

As our own observations differ from those of Stanton (1915) the larva is redescribed here.

Length 4.5–5.5 mm. Colour light yellowish brown or brownish grey. Antennae without branched hair. Median clypeal hairs long and slender, simple, sometimes carrying a few minute hairs; external clypeal hairs nude and simple; posterior ones short, nude, simple; occipital hairs with 2–3 branches. Shoulder hairs usually pigmented, median and internal ones with strong stems, numerous branches and stout roots, often uniting into one. Small fans on thorax, with 10–11 non-serrate leaflets. On abdominal segment i very small fans with 5–7 hair-like leaflets;

on segment ii small fans with 8-11 very narrow leaflets ; on segments iii-vii complete fans with about 18 leaflets each, showing 2-3 indentations near the apex, the latter pointed or rounded, no filament. The leaflets are pigmented throughout.

Breeds in stagnant shady freshwater pools.

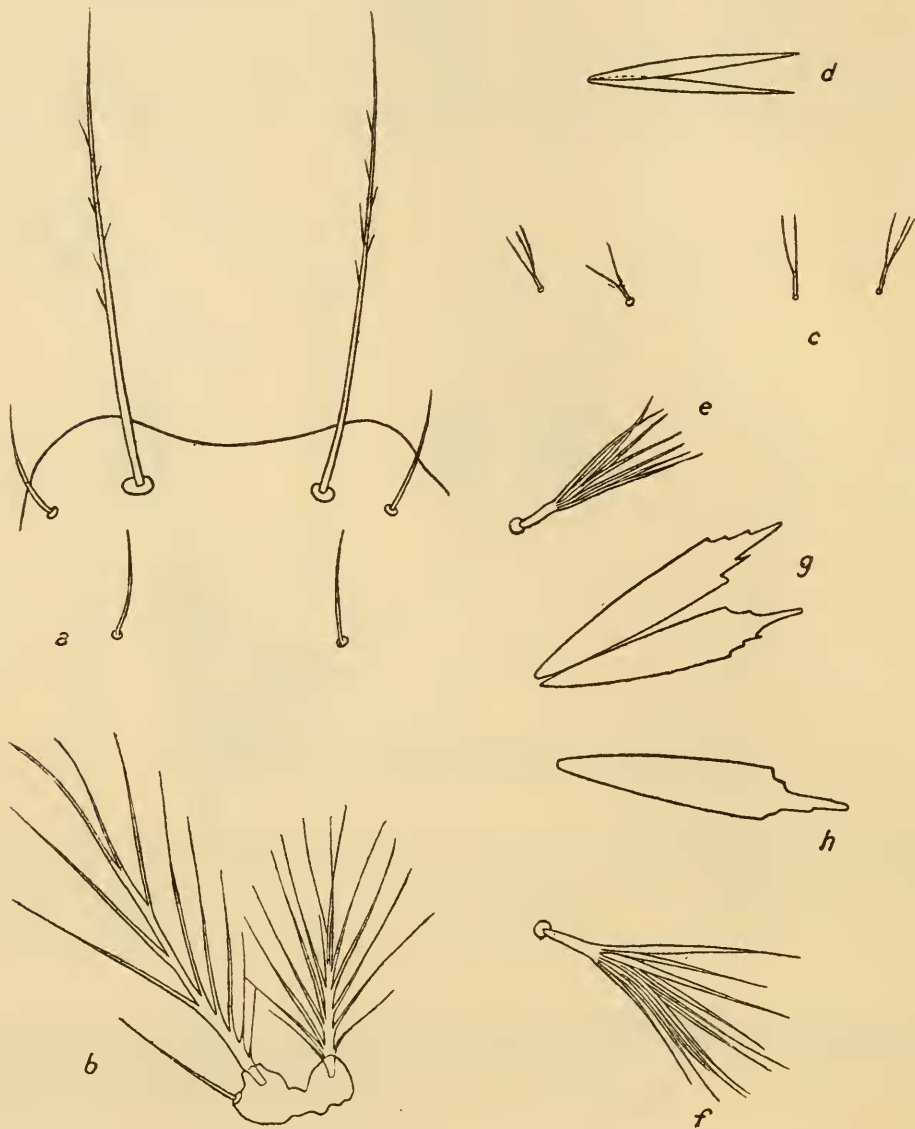


Fig. 7. Larva of *Neomyzomyia leucosphyra*: a, clypeus; b, shoulder hairs (left); c, occipital hairs; d, leaflet of thoracic fan; e, leaflet of fan on abd. segment i; f, leaflet on segment ii; g, leaflet on segment iii; h, leaflet on segment v.

3. *Myzorhynchus umbrosus*.

Addition to Stanton's description. Another larval type was usually met with in salt or brackish water near the coast, with median clypeal hairs bearing numerous short hairs on the apical half. The adult emerging from this was of the usual *umbrosus* type.

4. *Myzomyia minima* var. *aconita* (fig. 8).

Addition to Stanton's description : In running water a larval type was common with completely nude median and simple long posterior clypeal hairs. The adult emerging from this larval variety showed the usual characteristics of *aconita*. The breeding places of the two larval types differ somewhat : out of 644 typical larvae 42 per cent. were found in rice fields, 11 per cent. in running water, 31 per cent. in fish-ponds, 15 per cent. in marshes and 1 per cent. in dirty stagnant water ; the percentages of 562 specimens of the larval variety found in the same breeding-places were 1·7, 88, 10, 0·3 per cent. and nil. Consequently the latter is more adapted to life in running water.

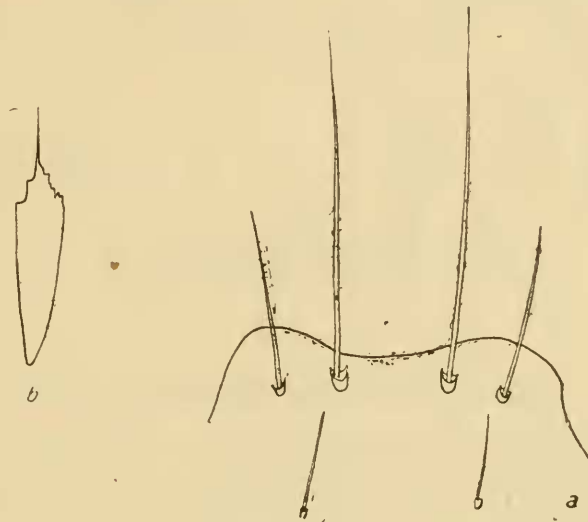


Fig. 8. *Myzomyia minima* var. *aconita*, larval variety : a, clypeus ; b, leaflet of fan on abdominal segment v.

It is to be noted that the larva of the typical *M. minima* (fig. 9) is almost identical with the larval variety of *aconita*, the only difference we could detect existing in the length of the filaments of the leaflets which is $\frac{1}{2}-\frac{3}{8}$ of that of the whole leaflet (in the larval variety of *aconita* this relation is usually $\frac{3}{10}-\frac{2}{5}$).

5. Differences between the Larvae of *Nyssorhynchus punctulata* var. *tesselata* and *Cellia kochi*.

Stanton enumerates them as follows : In *N. punctulata* there are no fans on abdominal segments i and ii, whereas in *C. kochi* they are present on the latter. We noted in both species on segments i and ii small fans with very narrow or hair-like leaflets ; in *C. kochi* on segment i sometimes a cockade only. Consequently in the Malay Archipelago the fans cannot be used to distinguish these larvae. We use the following characters : In *N. punctulata* : (a) Antennae usually much pigmented ; (b) occipital hairs short with 3 or more branches ; (c) internal shoulder hairs short, usually with no more than 3 apical branches.

In *C. kochi* : (a) Antennae light ; (b) occipital hairs longer, unbranched or bifurcated ; (c) internal shoulder hairs long, with numerous long branches inserted at intervals along the stem.

In the Australian region of the Malay Archipelago, a larval variety of *N. punctulata* is commonly met with, bearing fans with non-serrate leaflets, no fans but cockades on the 2nd abdominal segment, and a small fan with hair-like leaflets on the 1st.

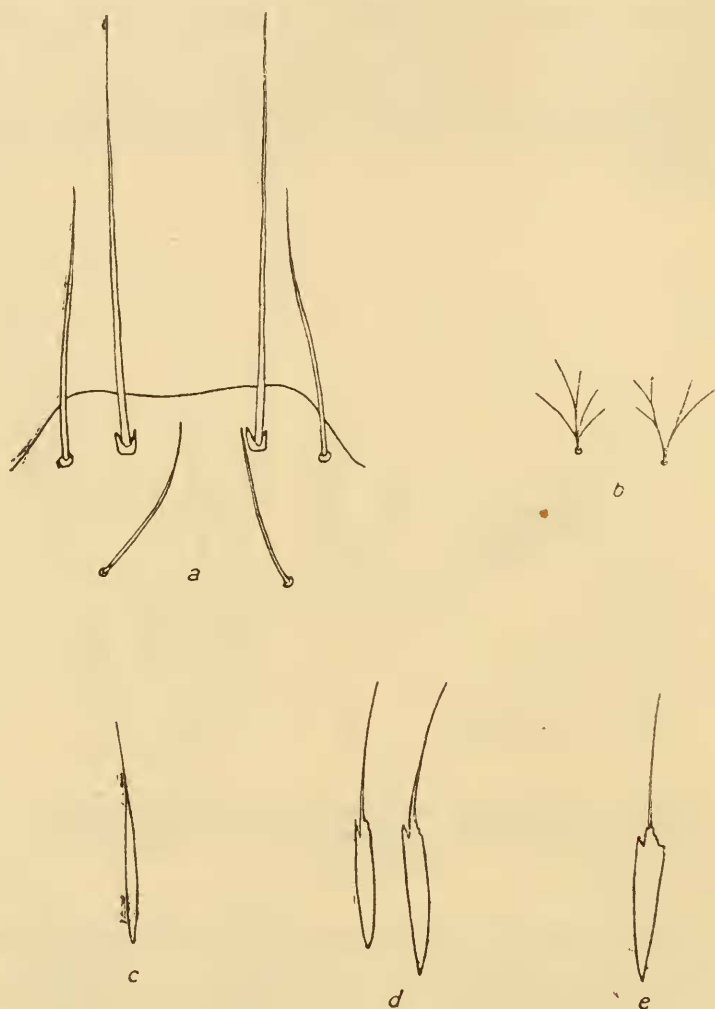


Fig. 9. Larva of *Myzomyia minima*: *a*, clypeus; *b*, occipital hairs (left); *c*, leaflet from fan on abdominal segment i; *d*, leaflet on segment iii; *e*, leaflet on segment vi.

6. Difference between the Larvae of *Myzorhynchus sinensis* and *M. barbirostris*.

In addition to Stanton's differential characters we noted the following, which however cannot be used if the larvae do not show white spots on the dorsum of the abdomen. But if these are present, they show in *M. sinensis* on abdominal segments iii, v, viii, in *M. barbirostris* on the segments iii and vi-viii but never on v. *N. annulipes* var. *moluccensis* has abdominal spots like *M. barbirostris*.

7. Abnormal Larvae of *Myzorhynchus sinensis* and *M. barbirostris* (fig.10).

In both species one of the median clypeal hairs may be placed in close proximity to the neighbouring external clypeal hair, at the same time exhibiting on a shortened

stem a number of long apical branches (10 or more), somewhat resembling the external clypeal hairs of *M. umbrosus*.

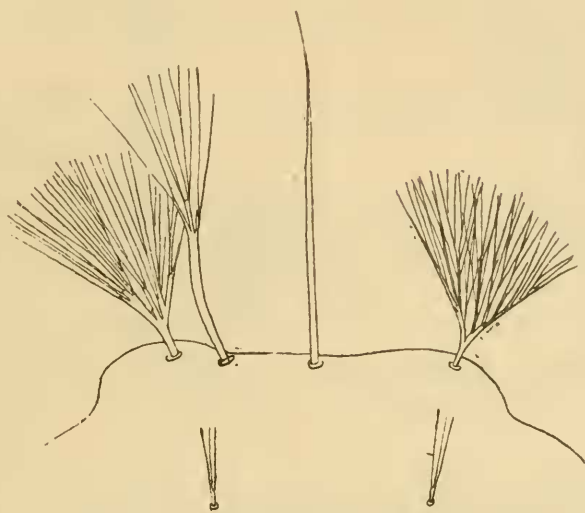


Fig. 10. Abnormal clypeus of larva of *Myzorhynchus sinensis*.

8. Variations in the larvae of *Myzomyia ludlowi* and *M. rossii*.

As yet we have not succeeded in differentiating these species; in both we have noted the following variations of the mature forms: (a) The posterior clypeal hairs are of normal length and bifurcated, or much shorter and trifurcated; (b) the median clypeal hairs are bifurcated; (c) all clypeal hairs bear 2–5 long apical branches.

These variations are infinitely more common in *M. rossii* than in *M. ludlowi*. Sometimes we found *M. rossii* emerging from larvae resembling those of *M. vaga* (*indefinita*).

9. Variations of the Larvae of *Myzomyia vaga* (*indefinita*).

We never found *M. vaga* with larvae like *M. ludlowi*, they always adhere to the type first described by Strickland (1915), *viz.*, with the short external and posterior clypeal hairs, the latter placed at a short distance behind the median clypeal hairs and closer together than these. As variations we have noted the bifurcation of the median and posterior clypeal hairs, the latter being placed farther backwards; also they may be placed close together, the one a little in front of the other.

10. *Nyssorhynchus schüffneri* (fig. 11).

The larva was described by Mangkoe Winoto (1918). They are difficult to distinguish from those of *N. fuliginosus*. The following are the characters which separate them: (a) the median clypeal hairs bear more and longer branches; (b) the posterior clypeal hairs are unbranched or bifid; (c) the stems and roots are less thick than in *N. fuliginosus*; (d) the filaments of the leaflets on the fans are somewhat shorter than in the same organs of *N. fuliginosus*.



Fig. 11. Larva of *Nyssorhynchus schüffneri*: *a*, clypeus; *b*, leaflet of fan on abdominal segment v.

III. QUESTIONS CONCERNING THE VALIDITY, DEFINITION AND NOMENCLATURE OF SOME SPECIES.

1. *Nyssorhynchus fuliginosus* var. *nivipes*.

This variety is characterised by the following points: (*a*) the white area on 2nd joint of the hind tarsus is very extensive, $\frac{1}{3}$ – $\frac{1}{2}$ of the joint. (*b*) wing much lighter, with smaller spots, notably on 3rd vein and upper branch of 5th. The same wing markings are present in the male of the typical *N. fuliginosus*, consequently they cannot be used to separate the males of the type and the variety.

2. *Myzomyia minima*, and var. *aconita*.

Christophers (1916) separates these two forms on the grounds that the type (*a*) has the proboscis in the ♀ dark, or with only a light ventral spot near the apex; (*b*) lacks a light fringe spot at the apex of the 6th vein; (*c*) has the apical half of the 6th vein completely dark; (*d*) has a long black spot on the base of the 3rd vein. To this we may add that (*e*) the type shows a broad black band on the middle of the light apex of the palps (in *aconita* this band is narrow). The two forms seem well separated by these characters, but we have met with otherwise typical *aconita* exhibiting the points (*b*) and (*c*), or (*a*), or (*b*) (*c*) (*e*). Moreover, we have found forms with the points (*b*) and (*c*) complete and (*a*), (*d*), (*e*) intermediate; *i.e.*, with a large light patch on the proboscis but ventrally only, a small black patch on the base of the 3rd vein and a band on the apex of the palps in breadth intermediate between that of *minima* and *aconita*. On the other hand, we have observed specimens bearing a spot on the base of the 3rd vein at least equalling in length $\frac{1}{2}$ of the stem of the 1st submarginal cell, but with all the other *minima* characters present likewise.

As we do not think it advisable to throw these two forms together, we propose a purely artificial but easily observable distinction, viz. :—

- (a) No spot on base of 3rd vein *M. aconita*, Dön.
- (b) A small spot present (length about $\frac{1}{4}$ of the 1st submarginal cell),
M. aconita var. *cohaesa*, Dön.
- (c) A long spot present (from half as long to as long as this cell). . . *minima*, Theo.

3. *Myzomyia vaga* (*indefinita*).

The species known under the name of *M. indefinita*, Ludl. (1904) is separated from *M. rossii* by (a) a narrow black band at the base of the light apex of the female palpi; (b) a light spot at the apex of the proboscis in the female, behind the labella; (c) a lighter colour; (d) its larger size; (e) the larva. The points (a), (c) and (d) are subject to great variation, (b) and (e) being constant and reliable; as (b) is not present in the males and (a) only refers to the females, the males cannot be distinguished with certainty.

In 1902 Dönitz described under the name *A. vagus* a mosquito distinct from although resembling *M. rossii*. The proboscis of the female is described as being black, with light apex and whitish labella. The palpi of the female are black, the terminal joints white, the penultimate with a broad black band around the base. A distinct variety from Celebes has the penultimate joint of the female palpus white only at the apex. As this is the condition actually existing in *M. rossii* we infer that the specimen on which the species *vagus* was founded had a narrower black palpal band. The species was described from a female caught at Fort de Koch (Sumatra) and we know that no *M. rossii* has ever been found there. From the description of the proboscis and palps of the female (in connection with the description of the variety from Celebes) and the origin of the type we believe that there can hardly be any doubt that Dönitz's *vagus* and the species now called *A. indefinitus* are identical.

Christophers (1916) suggests that Giles' *M. rossii* might be the one with the broad white apex of the palps. As Giles (1900) states that the apical half of the end joint (*i.e.*, of the two terminal joints taken together) is white in the female, we believe this supposition to be not well founded. On the other hand we believe him to be quite right in suggesting that Ludlow's *indefinita* is indeed *M. rossii*, Giles, as she distinctly states (1904) that the palpal markings and general colour of her new species are like those of *M. ludlowi*.

4. Difference between *Myzomyia ludlowi* and *M. rossii*.

The following wing marking is very constant and reliable: on the upper branch of the 5th vein, below the cross-veins, both species show two spots, which however in *M. rossii* (and *M. vaga*) are short, whereas in *M. ludlowi* they are much longer. An extensive biometrical research has convinced us that exceptions to this rule are rare (Swellengrebel 1916, Mangkoe Winoto 1918).

5. *Neomyzomyia punctulata* and *N. tesselata* (*A. deceptor*, Dön.).

One of us has shown already that the characters differentiating these two species, so far as they are based on the wing markings, cannot be accepted as valid. Consequently the species are separated only by the palpal markings: in *N. tesselata*

the second palpal joint of the female is white on the apical half, in *N. punctulata* it bears a black sub-apical ring, separated however by a narrow light ring from the basal black ring of the 3rd joint. We do not consider this difference of sufficient value to justify a new species and consequently we rank *N. tesselata* as a variety of *N. punctulata*.

Dönitz believed the var. *tesselata* to be peculiar to the western regions of the Malay Archipelago only, but we have found it as far eastward as Ceram (Moluccas). Dönitz's typical *punctulata* we have never met with. The eastern *punctulata* var. *tesselata* differs however from the common western type, (a) by the larvae (p. 7.), (b) by the light portion of the proboscis being distinctly diminished in size.

6. *Nyssorhynchus schüffneri*.

Christophers (1916) seems to suggest that this species resembles *N. fuliginosus* var. *adiei*, James. It is said to differ from it by the very short ultimate joint of the female palpus. We found the length of this joint to be 11 per cent. of the palpal length, the palpal index being 0.6, consequently it is an orthodactylous mosquito. But there are other, more striking differences. The palps have 3 white bands only (4 in *adiei*), with a long white tip resembling *M. vaga*. The wing, which in the var. *adiei* is like that in *N. fuliginosus* (judging by James' description), is much lighter in *schüffneri*; the black spots on the costa are rather narrow, on 2nd longitudinal vein one small spot under the 3rd costal spot (reckoned from the apex). Stem of 4th longitudinal vein nearly all yellow, so is the 3rd vein (in *adiei* it is black, except for a few minute light spots).

IV. GEOGRAPHICAL DISTRIBUTION.

A considerable portion of the Malay Archipelago has been searched for Anophelines, and although much remains to be done, we wish to draw attention to the following striking features in the geographical distribution of certain species and varieties.

1. *Nyssorhynchus annulipes* var. *moluccensis*.

Wherever it occurs this is a very common species, breeding everywhere, and so it is difficult to overlook it. Still it has never been found in Sumatra, Java, Borneo, Celebes and the smaller islands of the western portion of the Archipelago, but it is the commonest Anopheline in the Moluccas and New Guinea. It is closely allied to the Australian *N. annulipes* and its distribution is in accordance with other zoological findings, showing the fauna of the eastern Archipelago to be mainly Australian. It is well known that Wallace divided the Archipelago into an Asiatic and an Australian region by a line following the Straits of Macassar and of Lombok. The Anophelines (and with them other animals; cf. Weber 1902) do not conform to this scheme, as the Anopheline fauna of Celebes, so far as we know at present, is purely Asiatic.

2. *Nyssorhynchus schüffneri*.

So far as we yet know, this species is confined to the western provinces of Java (Batavia, Bantam) and the neighbouring Lampong districts of South Sumatra, which are separated from the former by the Soenda Strait.

3. *Myzomyia rossii*.

Christophers (1916) states that *M. rossii*, Giles, is the common western form, whilst *M. vaga*, Dön. (*indefinita*, Ludl.) occurs throughout Malaya. To this should be added that *M. rossii* does so likewise, as far as the Moluccas; only in Sumatra it has not been found, up till now.

4. *Myzomyia ludlowi* and *Myzorhynchus sinensis*.

We failed to find both species east of Celebes. But we know that in districts where *M. ludlowi* usually is of common occurrence, it may be absent for months and even for a whole year (Citroen 1917). As suitable breeding places were present, likewise its common satellite *M. rossii*, we are not sure that *M. ludlowi* is really absent from the Australian regions of the Archipelago.

5. *Stethomyia aitkenii*

The form with the typical larvae—including all variations described by Stanton (1915) and Strickland (1915)—was not found in the Australian region of the Archipelago. The species was represented there by the varieties *insulae-florum* and *papuae*, which in their turn were absent from the western regions, except var. *insulae-florum*, which occurs on the south coast of Java (Island of Noesa Kembangan).

The following table gives a summary of our present knowledge of the distribution of the Anophelines in the Malay Archipelago.

	<i>Javanensis</i>	<i>minima</i>	<i>arconia</i>	<i>rossii</i>	<i>ludlowi</i>	<i>vaga</i> <i>indefinita</i>	<i>punctuata</i> var. <i>less.</i>	<i>leucosphyræ</i>	<i>koehi</i>	<i>sinensis</i> (all varieties)	<i>barbirostris</i>	<i>barbi.</i> var. <i>pallidus</i>	<i>albocinctatus</i>	<i>mauritanus</i>	<i>nimbrosus</i>	<i>gigas</i>	<i>Juliginosus</i>	<i>maculatus</i>	<i>schiffneri</i>	<i>karwari</i>	<i>annulipes</i> var.	<i>molucaensis</i>	<i>jamesi</i>	<i>aitkeni</i>	<i>aitkeni</i> (varieties)	<i>brevipalpis</i>
Sumatra	+	+	+	—	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	—	—	+	—	—	
Java	+	—	+	+	+	+	+	+	+	+	+	+	+	+	—	+	+	+	—	—	—	+	+	+	—	
Borneo, incl. findings of Roper (1914) ..	—	—	+	+	+	+	+	+	+	+	—	+	—	+	—	—	—	+	—	—	—	—	—	—	+	
Celebes	—	—	—	+	+	+	+	—	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Moluccas and New Guinea	—	—	—	+	—	+	+	—	—	—	+	+	—	—	—	—	—	—	—	—	+	—	—	+	—	
Riouw and Linga Archipelagos ..	—	—	—	—	+	—	—	—	+	+	—	—	—	—	—	—	—	+	—	+	—	—	+	—	—	

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